明細書

電子増倍管

技術分野

[0001] 本発明は、複数のダイノードが積層状態で多段に配置されるダイノード部を備えた電子増倍管に関するものである。

背景技術

- [0002] 電子増倍管のダイノード部として、複数のダイノードが積層状態で多段に配置されたものが一般に知られている(例えば特許文献1参照)。この種のダイノード部を備える電子増倍管において、その真空容器を構成するステム板には、各ダイノードに制御電圧を供給するための複数のステムピンが貫通状態で固定されており、各ステムピンの先端部が各ダイノードの周縁部に固着されることで、複数のダイノードが相互に平行に多段に支持されている(例えば特許文献2参照)。
- [0003] ここで、特許文献2に記載の電子増倍管では、多段に支持される複数のダイノードの相互間隔を均一に保つため、各ダイノードの対向面間に微細な絶縁ボールが介設されている。この絶縁ボールは、各ダイノードの対向面に形成されたテーパ穴状の凹部に嵌め込まれて脱落が防止されている。

特許文献1:特開2000-3693号公報(図1)

特許文献2:特開平8-7825号公報(図1)

発明の開示

発明が解決しようとする課題

- [0004] ところで、特許文献1または特許文献2に記載された従来例の電子増倍管では、ダイノード部に強い振動や衝撃が加わった場合、ステムピンが撓んで各ダイノードが相互に横ずれを起こす懸念がある。このため、使用環境によっては耐振性能が不足する場合がある。
- [0005] そこで、本発明は、耐振性能に優れたダイノード部を備える電子増倍管を提供する ことを課題とする。

課題を解決するための手段

- [0006] 本発明に係る電子増倍管は、複数のダイノードが相互に絶縁された積層状態で多段に配置されるダイノード部を真空容器内に備える電子増倍管であって、各ダイノードを相互に絶縁するための複数の絶縁板と、各ダイノードおよび各絶縁板を嵌合または係合させるように真空容器を構成するステム板に立設された支柱とを備え、各ダイノードおよび各絶縁板が支柱に嵌合または係合された状態で交互に積み重ねられ、支柱の先端部に係止部材が固定されて各ダイノードおよび各絶縁スペーサが支柱に一体的に支持されていることを特徴とする。
- [0007] 本発明に係る電子増倍管では、真空容器を構成するステム板に立設された支柱に対してダイノード部の各ダイノードおよび各絶縁板が嵌合または係合され、この状態で各ダイノードおよび各絶縁板が支柱により一体的に堅固に支持されているため、各ダイノードおよび各絶縁板が加速度や衝撃により不用意に横ずれを起こすことがなく、ダイノード部は優れた耐振性能を発揮する。

発明の効果

[0008] 本発明に係る電子増倍管によれば、真空容器を構成するステム板に立設された支柱に対してダイノード部の各ダイノードおよび各絶縁板が嵌合または係合され、この状態で各ダイノードおよび各絶縁板が支柱により一体的に堅固に支持されているため、各ダイノードおよび各絶縁板が振動や衝撃により不用意に横ずれを起こすことがなく、ダイノード部は優れた耐振性能を発揮することができる。

図面の簡単な説明

- [0009] [図1]本発明の一実施形態に係る電子増倍管の内部構造を示す縦断端面図である。 [図2]図2は図1に示したダイノード部の主要構成部材の斜視図である。 符号の説明
- [0010] 1…側管、2…受光面板、3…ステム板、4…フォーカス電極、5…ダイノード部、5A …ベネシアンブラインドダイノード、5A1…装着孔、5B…メタルチャンネルダイノード、5B1…装着孔、6…アノード、6A…装着孔、7…シールリング、8…排気管、9…支柱、10…絶縁カラー、11…絶縁スペーサ(絶縁板)、12…絶縁リング、13…絶縁リング、14…ナット。

発明を実施するための最良の形態

- [0011] 以下、図面を参照して本発明に係る電子増倍管の実施の形態を説明する。参照する図面において、図1は一実施形態に係る電子増倍管の内部構造を示す縦断端面図、図2は図1に示したダイノード部の主要構成部材の斜視図である。
- [0012] 図1に示すように、一実施形態に係る電子増倍管は、例えば円筒状の側管1の一端の開口部に受光面板2が気密に固定され、他端の開口部にステム板3が気密に固定された構造の真空容器内にフォーカス電極4、ダイノード部5、アノード6などが収容されたヘッドオン型のPMT(光電子増倍管)として構成されている。
- [0013] 側管1は、両端部にフランジが形成されたコバール金属管で構成されており、一端のフランジには受光面板2の周縁部が熱融着され、他端のフランジにはステム板3のフランジが溶接にて接合されている。
- [0014] 受光面板2は、例えば厚さが0.7mm程度の円形のコバールガラスで構成されており、光入射窓に対面する部分の内面には光電面(図示省略)が形成されている。
- [0015] なお、受光面板2の材質は、必要とする光の透過特性に応じて合成石英、UVガラス、硼珪酸ガラスなどに適宜変更することができる。
- [0016] ステム板3は、コバール金属製であり、内部に硼硅酸ガラスからなる絶縁シール材3 Aが充填される皿状に形成されている。このステム板3には、図示しない複数のステム ピンが気密に貫通してダイノード部5の各ダイノードに接続されている。このステム板3 の中心部には、真空容器内を真空引きするための排気管8が気密に嵌合して固定されており、その外端部は閉塞されている。
- [0017] ここで、ステム板3には、フォーカス電極4、ダイノード部5の各段のダイノードおよび アノード6を堅固に支持するための支柱9が例えば4本立設されている。各支柱9は、 基端部がステム板3を貫通した状態で絶縁シール材3Aに気密に埋設されている。そ して、各支柱9には、それぞれ絶縁パイプ10が嵌合されている。
- [0018] フォーカス電極4は、各支柱9に嵌合する装着孔4Aが形成されたフランジ部4Bを有する短い円筒状(または角筒状)に形成されており、その開口部を受光面板2に向けて側管1の内側に配置されている。
- [0019] ここで、ダイノード部5は、例えば1段目のダイノードがベネシアンブラインドダイノー

ド5Aで構成され、2段目以降、例えば14段目までのダイノードがメタルチャンネルダイノード5Bで構成されている。

- [0020] ベネシアンブラインドダイノード5Aは、図2に示すように、各絶縁パイプ10(図1参照)に嵌合する装着孔5A1が4隅に形成された基板5A2から略45度の角度で切り起こされたルーバ状の複数の電極エレメント5A3を有する。各電極エレメント5A3は、相互に平行に隣接して同方向に傾斜しており、全体としてブラインド状の外観を呈する。
- [0021] 各電極エレメント5A3の受光面板2側に向く外面には、受光面板2の光電面から放出されてフォーカス電極4により収束される光電子を受け、これを増倍した2次電子を放出する2次電子放出面が形成されている。
- [0022] このような構造のベネシアンブラインドダイノード5Aは、各電極エレメント5A3の2次電子放出面が相互に隣接しており、全体として広い面積を確保しているため、光電子の収集効率が高く、2段目のベネシアンブラインドダイノード5Aに対し、より多くの2次電子を放出することができる。
- [0023] メタルチャンネルダイノード5Bは、各絶縁パイプ10(図1参照)に嵌合する装着孔5B1が4隅に形成された基板5B2にスリット状に開口された複数の貫通孔5B3を有する。各貫通孔5B3は、ベネシアンブラインドダイノード5Aの各電極エレメント5A3に沿って相互に平行に延びている。
- [0024] 各貫通孔5B3は、2次電子の収集側の開口幅に較べて放出側の開口幅が広くなるように傾斜した断面形状の内壁面を有し(図1参照)、その内壁面には、収集側から入射された2次電子を増倍して放出する2次電子放出面が形成されている。
- [0025] ここで、図1に示すように、ダイノード部5の1段目のベネシアンブラインドダイノード5 Aおよび2〜14段目のメタルチャンネルダイノード5Bは、相互に絶縁された積層状態でアノード6および最終段のダイノード5Cと共に多段に支持される。
- [0026] そのための構造として、アノード6および最終段のダイノード5Cの4隅には、図2に示すように、各絶縁パイプ10(図1参照)に嵌合する装着孔6Aおよび装着孔5C1がそれぞれ形成されている。また、図1に示すように、各絶縁パイプ10に嵌合される複数のワッシャ状の絶縁スペーサ(絶縁板)11および複数の絶縁リング12,13が設け

られると共に、各支柱9の先端部に形成されたオネジ部9Aに螺合される複数のナット 14が設けられている。

- [0027] そして、各絶縁パイプ10に対し、絶縁リング12、最終段のダイノード5Cの装着孔5 C1、絶縁スペーサ11、アノード6の装着孔6A、絶縁スペーサ(絶縁板)11がこれらの順序で嵌合され、続いてメタルチャンネルダイノード5Bの装着孔5B1および絶縁スペーサ(絶縁板)11が交互に各絶縁パイプ10に嵌合され、さらにベネシアンブラインドダイノード5Aの装着孔5A1および絶縁リング13が各絶縁パイプ10に嵌合されることにより、1段目のベネシアンブラインドダイノード5Aおよび2〜14段目のメタルチャンネルダイノード5Bが相互に絶縁された積層状態でアノード6および最終段のダイノード5Cと共に多段に配置されている。
- [0028] ここで、各支柱9の先端部にはフォーカス電極4のフランジ部4Bに形成された各装着孔4Aが嵌合されており、各支柱9の先端部のオネジ部9Aに係止部材として螺合された各ナット14がフォーカス電極4のフランジ部4Bを介して絶縁リング13を押圧することにより、フォーカス電極4、1段目のベネシアンブラインドダイノード5A、2〜14段目のメタルチャンネルダイノード5B、アノード6および最終段のダイノード5Cが各絶縁スペーサ(絶縁板)11と共に各支柱9に一体的に堅固に支持されている。
- [0029] 以上のように構成された一実施形態の電子増倍管では、被測定光が受光面板2に 照射されると、その裏面の光電面が光電子を放出し、放出された光電子がフォーカス 電極4の作用により1段目のベネシアンブラインドダイノード5Aに収束される。
- [0030] ここで、1段目のベネシアンブラインドダイノード5Aは、各電極エレメント5A3の2次電子放出面が相互に隣接しており、全体として広い面積を確保しているため、フォーカス電極4により収束された光電子を効率良く収集して増倍し、増倍した2次電子を2段目のメタルチャンネルダイノード5Bに向けて放出する。
- [0031] 2〜14段目のメタルチャンネルダイノード5Bは、1段目のベネシアンブラインドダイノード5Aが効率良く収集して増倍した2次電子を効率良く順次増倍する。
- [0032] そして、2〜14段目のメタルチャンネルダイノード5Bにより増倍された2次電子は、アノード6により電気信号として効率良く検出される。
- [0033] また、一実施形態の電子増倍管は、ダイノード部5の2〜14段目までのダイノードが

積層状態を薄くできるメタルチャンネルダイノード5Bで構成されているため、ダイノー ド部5の積層方向の全長を短くコンパクトに構成することができる。

- [0034] ここで、一実施形態の電子増倍管では、真空容器を構成するステム板3に立設された複数の支柱9にそれぞれ絶縁パイプ10が嵌合され、各絶縁パイプ10に対し、ダイノード部5を構成するベネシアンブラインドダイノード5Aの各装着孔5A1、各メタルチャンネルダイノード5Bの各装着孔5B1および各絶縁スペーサ(絶縁板)11が嵌合されている。そして、この状態でベネシアンブラインドダイノード5A、各メタルチャンネルダイノード5Bおよび各絶縁スペーサ(絶縁板)11が支柱9に対し一体的に堅固に支持されている。
- [0035] 従って、一実施形態の電子増倍管によれば、ダイノード部5のベネシアンブラインドダイノード5A、各メタルチャンネルダイノード5Bおよび各絶縁スペーサ(絶縁板)11が振動や衝撃により不用意に横ずれを起こすことがなく、ダイノード部5は優れた耐振性能を発揮する。
- [0036] ちなみに、従来例の電子増倍管では耐振性能が1000m/s²であったが、一実施 形態の電子増倍管では、耐振性能が従来例の3倍の3000m/s²に上昇した。
- [0037] 本発明に係る電子増倍管は、一実施形態に限定されるものではない。例えばダイノード部5は、全段のダイノードがメタルチャンネルダイノードで構成されていてもよいし、ベネシアンブラインドダイノードで構成されていてもよい。
- [0038] また、絶縁スペーサ(絶縁板)11は、ワッシャ状に限らず、4隅に装着孔が形成された角型リング状に形成されていてもよい。
- [0039] さらに、各支柱9の先端部に螺合されるナット14に代えて各支柱9の先端部に適宜 の係止部材が接着または溶着されていてもよい。
- [0040] また、本発明の電子増倍管は、光電面を有しない電子増倍管としてもよい。 産業上の利用可能性
- [0041] 本発明によれば、真空容器を構成するステム板に立設された支柱に対してダイノード部の各ダイノードおよび各絶縁板が嵌合または係合され、この状態で各ダイノードおよび各絶縁板が支柱により一体的に堅固に支持されているため、各ダイノードおよび各絶縁板が振動や衝撃により不用意に横ずれを起こすことがなく、ダイノード部は

優れた耐振性能を発揮する電子増倍管を提供することができる。

請求の範囲

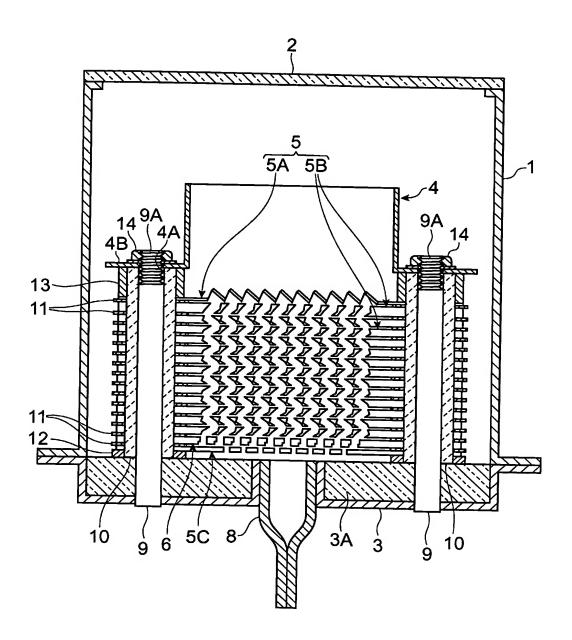
[1] 複数のダイノードが相互に絶縁された積層状態で多段に配置されるダイノード部を真空容器内に備える電子増倍管であって、

前記各ダイノードを相互に絶縁するための複数の絶縁板と、

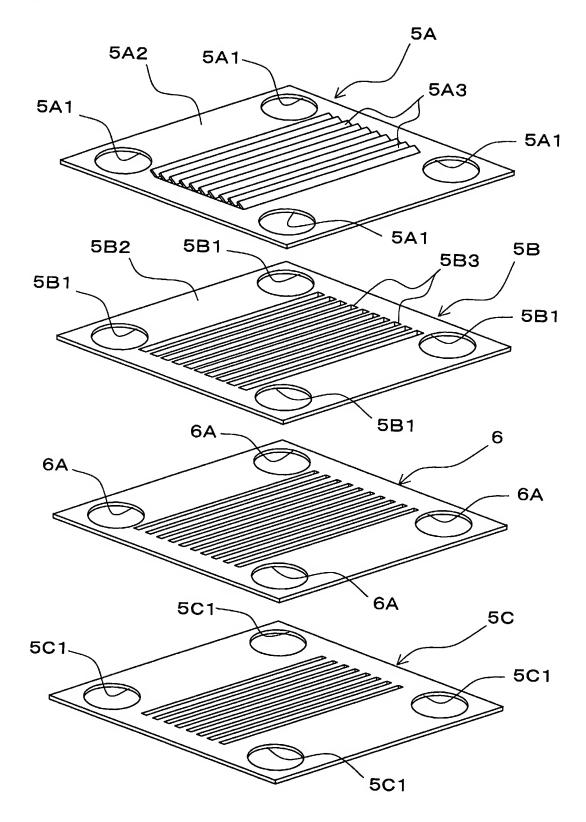
前記各ダイノードおよび各絶縁板を嵌合または係合させるように前記真空容器を構成するステム板に立設された支柱とを備え、

前記各ダイノードおよび各絶縁板が前記支柱に嵌合または係合された状態で交互に積み重ねられ、前記支柱の先端部に係止部材が固定されて各ダイノードおよび各絶縁スペーサが前記支柱に一体的に支持されていることを特徴とする電子増倍管。

[図1]



[図2]



INTERNATIONAL SEARCH REPORT

filing date Cl. document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) Cl. document referring to an oral disclosure, use, exhibition or other means document referring to an oral disclosure, use, exhibition or other the priority date claimed Cl. document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) Cl. document of particular relevance; the claimed invention cannot be document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family Cl. document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family Cl. document of particular relevance; the claimed invention cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone The priority date claimed invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone The priority date claimed invention cannot be considered to involve an inventive step when the document is taken alone The priority date claimed invention cannot be considered to involve an inventive step when the document is taken alone The priority date claimed invention cannot be considered to involve an inventive step when the document is taken alone The priority date claimed invention cannot be considered to involve an inventive step when the document is taken alo		EVILLEUMIONAL SEARCH REPOR	•	International app	lication No.
According to International Patent Classification (PC) or to both national classification and IPC B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl' H01J43/00-43/30 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitauyo Shinan Koho 1922-1995 Toroku Jitauyo Shinan Koho 1971-2004 Jitauyo Shinan Koho 1971-2004 Jitauyo Shinan Koho 1996-2004 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Catagory* Citation of document, with indication, where appropriate, of the relevant passages Relevant to chaim No. A JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 I 4 February, 1997 (14.02.97), Full text; all drawlings s EP 743672 A2 A JF 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JF 5-325878 A (Hamamatsu Photonics Kabushiki 1 D December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 s EP 571185 A1 Special categories of clad documents: Comment defining the general state of the ant which is not considered a family and the special restores of the special restores the claimed invention cannot be document the special restores the claimed invention cannot be appealed in the continuation of the content with mary throw doubts on priority claim(s) or which is a problem of the principle or iterory underlying the invention cannot be appealed in the content of the principle or iterory underlying the invention cannot be appealed and the special restores the claimed invention cannot be appealed and the special restores the claimed invention cannot be appealed and the special restores the claimed invention cannot be appealed and the special restores the claimed invention cannot be appealed and the special restores cannot be appealed to involve an invent	A CLASSIE	PCT/JP	2004/008442		
According to International Patent Classification (IPC) or to both national classification and IPC B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl.* H01J43/00-43/30 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitauyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2004 Kokal Jitsuyo Shinan Koho 1994-2004 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. A JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 6 EP 571185 Al 6 US 5578891 A EVALUATE TOWN OF A STATE OF A ST	Int.Cl	CATION OF SUBJECT MATTER 7 HO1.T43/22			
Minimum documentation searched (classification system followed by classification symbols) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Robo 1922-1996 Torroku Jitsuyo Shinan Robo 1994-2004 Kokai Jitsuyo Shinan Robo 1971-2004 Jitsuyo Shinan Toroku Robo 1996-2004 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. A JP 9-42575 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 Kaisha), 10 December, 1993 (10.12.93), Par. No. (10066); Figs. 7, 8 6 EP 571185 Al 6 US 5578891 A Further documents are listed in the continuation of Box C. Special categories of clied documents: A Special categories of clied documents: Comment defining the general state of the art which is not considered to include relevance to the considered of involve an investive and comment defining the general state of the art which is not considered to establish the publication date of another clienton or other special reasons (as specifical) content which may throw doubts on priority claim(s) or which is deciment of particular relevance; the claim diversion cannot be considered on the considered of particular relevance; the claim of the priority date cannot be considered on the considered of particular relevance; the claimed investion cannot be considered only or cannot be considered only or cannot be considered on the considered on the considered of particular relevance; the claimed investion cannot be considered only or cannot be considered only or cannot be considered only or cannot be considered on the considered on the considered only or cannot be considered on the considered only or cannot be considered on the proprior of particula		. 101045/22			
Minimum documentation searched (classification system followed by classification symbols) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Robo 1922-1996 Torroku Jitsuyo Shinan Robo 1994-2004 Kokai Jitsuyo Shinan Robo 1971-2004 Jitsuyo Shinan Toroku Robo 1996-2004 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. A JP 9-42575 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 Kaisha), 10 December, 1993 (10.12.93), Par. No. (10066); Figs. 7, 8 6 EP 571185 Al 6 US 5578891 A Further documents are listed in the continuation of Box C. Special categories of clied documents: A Special categories of clied documents: Comment defining the general state of the art which is not considered to include relevance to the considered of involve an investive and comment defining the general state of the art which is not considered to establish the publication date of another clienton or other special reasons (as specifical) content which may throw doubts on priority claim(s) or which is deciment of particular relevance; the claim diversion cannot be considered on the considered of particular relevance; the claim of the priority date cannot be considered on the considered of particular relevance; the claimed investion cannot be considered only or cannot be considered only or cannot be considered on the considered on the considered of particular relevance; the claimed investion cannot be considered only or cannot be considered only or cannot be considered only or cannot be considered on the considered on the considered only or cannot be considered on the considered only or cannot be considered on the proprior of particula				•	
Minimum documentation searched (classification system followed by classification symbols) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Robo 1922-1996 Torroku Jitsuyo Shinan Robo 1994-2004 Kokai Jitsuyo Shinan Robo 1971-2004 Jitsuyo Shinan Toroku Robo 1996-2004 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. A JP 9-42575 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 Kaisha), 10 December, 1993 (10.12.93), Par. No. (10066); Figs. 7, 8 6 EP 571185 Al 6 US 5578891 A Further documents are listed in the continuation of Box C. Special categories of clied documents: A Special categories of clied documents: Comment defining the general state of the art which is not considered to include relevance to the considered of involve an investive and comment defining the general state of the art which is not considered to establish the publication date of another clienton or other special reasons (as specifical) content which may throw doubts on priority claim(s) or which is deciment of particular relevance; the claim diversion cannot be considered on the considered of particular relevance; the claim of the priority date cannot be considered on the considered of particular relevance; the claimed investion cannot be considered only or cannot be considered only or cannot be considered on the considered on the considered of particular relevance; the claimed investion cannot be considered only or cannot be considered only or cannot be considered only or cannot be considered on the considered on the considered only or cannot be considered on the considered only or cannot be considered on the proprior of particula	According to In	ternational Patent Classification (IPC) or to both natio	onal classification and IP	С	
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2004 Kokai Jitsuyo Shinan Koho 1971-2004 Jitsuyo Shinan Toroku Koho 1996-2004 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. A JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 14 February, 1997 (14.02.97), Full text; all drawings 6 EP 743672 A2 & US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 10 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 6 EP 571185 A1 & US 5578891 A X Further documents are listed in the continuation of Box C. Special categories of cited documents: A document defining the general state of the art which is not considered of continuation of the					
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2004 Kokai Jitsuyo Shinan Koho 1971-2004 Jitsuyo Shinan Toroku Koho 1996-2004 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. A JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 14 February, 1997 (14.02.97), Full text; all drawings 6 EP 743672 A2 & US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 10 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 6 EP 571185 A1 & US 5578891 A X Further documents are listed in the continuation of Box C. Special categories of cited documents: A document defining the general state of the art which is not considered of continuation of the	Minimum docu	mentation searched (classification system followed by	classification symbols)	···	<u> </u>
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.	Int.Cl	H01J43/00-43/30	esabbinedition symbols)		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.					
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.			•	•	
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.	Documentation	searched other than minimum documentation to the ex	tent that such documents	are included in th	- 6-14 1 1
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. A JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 Kaisha), 14 February, 1997 (14.02.97), Full text; all drawings 6 EP 743672 A2 6 US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 10 December, 1993 (10.12.93), Par. No. (0006]; Figs. 7, 8 6 EP 571185 A1 6 US 5578891 A Entire replication or patent but published on or after the international filing date or priority to be of particular relevance; the claimed invention cannot be considered to subplication date of another citation or other means of comment defining the general state of the actual completion of the international filing date to be of particular relevance; the claimed invention cannot be considered to comment defining the general state of the relevant passages Ferman and mailing address of the ISA/ Japanese Patent Office Authorized officer Jitsup of the relevant passages Relevant to claim No. 1		1922-1990	rotoku ojesuyo Si	linan Koho	1994–2004
C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. J P 9-45275 A (Hamamatsu Photonics Kabushiki 1 14 February, 1997 (14.02.97), Full text; all drawings 6 EP 743672 A2 6 US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 6 EP 571185 A1 6 US 5578891 A Further documents are listed in the continuation of Box C. Special categories of cited documens: document defining the general state of the art which is not considered to be of particular relevance in the principle of theory underlying the brown binding date and not in conflict with the splication of the principle of theory underlying the brown binding date and not in conflict with the splication of the principle of theory underlying the brown binding date and not in conflict with the splication of the principle of the principle of the principle of the principle of the brown bind in when the principle of the		resulto sittian kono 1971-2004	Jitsuyo Shinan To	oroku Koho	1996-2004
C. DOCUMENTS CONSIDERED TO BE RELEVANT Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. J P 9-45275 A (Hamamatsu Photonics Kabushiki 1 14 February, 1997 (14.02.97), Full text; all drawings 6 EP 743672 A2 6 US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 6 EP 571185 A1 6 US 5578891 A Further documents are listed in the continuation of Box C. Special categories of cited documens: document defining the general state of the art which is not considered to be of particular relevance in the principle of theory underlying the brown binding date and not in conflict with the splication of the principle of theory underlying the brown binding date and not in conflict with the splication of the principle of theory underlying the brown binding date and not in conflict with the splication of the principle of the principle of the principle of the principle of the brown bind in when the principle of the	Electronic data l	pase consulted during the international search (name o	f data base and where no	acticable seemb to	
Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 14 February, 1997 (14.02.97), Full text; all drawings © EP 743672 A2 © US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 I December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 © EP 571185 A1 E US 5578891 A Further documents are listed in the continuation of Box C. See patent family annex. Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance active application or patent but published on or after the international filing date or priority date and not in conflict or the origination of accument relevance active application or patent but published on or after the international filing date or priority document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document effering to an oral disclosure, use, exhibition or other means document published prior to the international filing date to unique an inventive account of particular relevance; the claimed invention cannot be considered to fination and the priority date claimed of particular relevance; the claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention and the priority date claimed invention cannot be considered to fination and the priority date claimed invention and the pr		,	o-co and, where pr	acticable, search to	erms used)
Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 14 February, 1997 (14.02.97), Full text; all drawings © EP 743672 A2 © US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 I December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 © EP 571185 A1 E US 5578891 A Further documents are listed in the continuation of Box C. See patent family annex. Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance active application or patent but published on or after the international filing date or priority date and not in conflict or the origination of accument relevance active application or patent but published on or after the international filing date or priority document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document effering to an oral disclosure, use, exhibition or other means document published prior to the international filing date to unique an inventive account of particular relevance; the claimed invention cannot be considered to fination and the priority date claimed of particular relevance; the claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention and the priority date claimed invention cannot be considered to fination and the priority date claimed invention and the pr					
Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 14 February, 1997 (14.02.97), Full text; all drawings © EP 743672 A2 © US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 I December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 © EP 571185 A1 E US 5578891 A Further documents are listed in the continuation of Box C. See patent family annex. Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance active application or patent but published on or after the international filing date or priority date and not in conflict or the origination of accument relevance active application or patent but published on or after the international filing date or priority document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document effering to an oral disclosure, use, exhibition or other means document published prior to the international filing date to unique an inventive account of particular relevance; the claimed invention cannot be considered to fination and the priority date claimed of particular relevance; the claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention cannot be considered to fination and the priority date claimed invention and the priority date claimed invention cannot be considered to fination and the priority date claimed invention and the pr	C. DOCUMEN	NTS CONSIDERED TO BE RELEVANT			
A JP 9-45275 A (Hamamatsu Photonics Kabushiki 1 14 February, 1997 (14.02.97), Full text; all drawings 6 EP 743672 A2 6 US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 10 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 6 EP 571185 A1 6 US 5578691 A E Special catsgories of cited documents: A document defining the general state of the art which is not considered to be of particular relevance; the claimed invention action of particular relevance; the claimed invention considered to the principle of theory underlying the invention document defining date of the actual completion of the international filing date to priority claim(s) or which is cited to establish the publication date of another citation or other means document published prior to the international filing date but later than document published prior to the international filing date but later than document published prior to the international filing date but later than the document is considered to involve an inventive considered to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter of particular relevance; the claimed invention cannot be considered to involve an inventive accounter of particular relevance; the clai			·		
Kaisha), 14 February, 1997 (14.02.97), Full text; all drawings & EP 743672 A2 & US 5841231 A A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 10 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 & EP 571185 A1 & US 5578891 A Expectate the state of the art which is not considered to be of particular relevance. For earlier application or patent but published on or after the international filing date or priority and the priority date of the publication date of another citation or other special reason (as special many how doubts on priority claim(s) or which is cited earlier application and the priority date claimed of document published prior to the international filing date to document published prior to the international filing date to document published prior to the international filing date but later than the priority date claimed Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search report 07 September, 2004 (07.09.04)					Relevant to claim No.
A	Α		tonics Kabushi	ki	1
A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 JO December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 & EP 571185 A1 & US 5578891 A Exp 571185 A1 & US 5578891					-
A JP 5-325878 A (Hamamatsu Photonics Kabushiki 1 JU December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 & EP 571185 A1 & US 5578891 A With a property of the publication or patent but published on or after the international filing date or priority claim(s) or which is cited to establish the publication date of another citation or other means of the publication date of another citation or other petition or patent but published prior to the international filing date but later than the priority date claimed Date of the actual completion of the international filing date but later than the priority date claimed Date of the actual completion of the international filing date but later than along the priority date claimed Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search report 07 September, 2004 (07.09.04) Authorized officer Au		Full text; all drawings	,		
A JP 5-325878 A (Hamamatsu Photonics Kabushiki 10 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 © EP 571185 All © US 5578891 A Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance to be of particular relevance to be of particular relevance to special reason (as specified) document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document referring to an onal disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed to the international filing date but later than the priority date claimed and the priority date claimed invention cannot be considered to involve an inventive step when the document is taken alone combined with one or more other such documents, such combination being obvious to a person skilled in the art document in the priority date claimed invention cannot be considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the	•		5 5841231 A		
Kaisha), 10 December, 1993 (10.12.93), Par. No. [0006]; Figs. 7, 8 & EP 571185 A1 & US 5578891 A Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance; to be of particular relevance; earlier application or patent but published on or after the international fling date Government which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other means document published prior to the international fling date but later than the priority date claimed invention cannot be considered to involve an inventive step when the document is taken alone Comment of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is taken alone Comment referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed invention cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search report 0.7 September, 2004 (07.09.04)	_	•			
Further documents are listed in the continuation of Box C. Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance caller application or patent but published on or after the international filing date document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) Od document referring to en oral disclosure, use, exhibition or other means of document published prior to the international filing date but later than the priority date claimed 20 August, 2004 (20.08.04) Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office See patent family annex. See patent family annex. I later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone document published are the international filing date but later than the priority date claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art of mailing of the international search report 0.7 September, 2004 (07.09.04)	Α	JP 5-325878 A (Hamamatsu Pho	otonics Kabush	iki	1
Further documents are listed in the continuation of Box C. Special categories of cited documents: 'A' document defining the general state of the art which is not considered to be of particular relevance E' carlier application or patent but published on or after the international filing date 'A' document defining the general state of the art which is not considered to be of particular relevance to be of particular relevance and the principle or theory underlying the invention cannot be considered novel or ca					_
Further documents are listed in the continuation of Box C. Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filling date 1" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) 3" document referring to an oral disclosure, use, exhibition or other means document published prior to the international filling date but later than the priority date claimed 20 August, 2004 (20.08.04) Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search 79 September, 2004 (07.09.04) Authorized officer		Par. No. [0006]: Figs 7 8	•		
Further documents are listed in the continuation of Box C. Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance cardier application or patent but published on or after the international filing date L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O" document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed Oate of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office See patent family annex. "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "8" document member of the same patent family Date of mailing of the international search report 07 September, 2004 (07.09.04)			5 5578891 A		
Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date the document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O" document referring to an oral disclosure, use, exhibition or other means the priority date claimed P." document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art "a" document member of the same patent family Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office Authorized officer Authorized officer			0010051 A		
Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date the document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O" document referring to an oral disclosure, use, exhibition or other means the priority date claimed P." document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art "a" document member of the same patent family Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office Authorized officer Authorized officer	ľ				
Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date the document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O" document referring to an oral disclosure, use, exhibition or other means the priority date claimed P." document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art "a" document member of the same patent family Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office Authorized officer Authorized officer				1	
Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date the document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O" document referring to an oral disclosure, use, exhibition or other means the priority date claimed P." document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art "a" document member of the same patent family Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office Authorized officer Authorized officer		·		J	
Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date the document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O" document referring to an oral disclosure, use, exhibition or other means the priority date claimed P." document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art "a" document member of the same patent family Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office Authorized officer Authorized officer					
Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date the document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O" document referring to an oral disclosure, use, exhibition or other means the priority date claimed P." document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art "a" document member of the same patent family Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office Authorized officer Authorized officer	ļ	,		ı	
Special categories of cited documents: A" document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date the document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O" document referring to an oral disclosure, use, exhibition or other means the priority date claimed P." document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art "a" document member of the same patent family Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing address of the ISA/ Japanese Patent Office Authorized officer Authorized officer	[<u>\sqrtar</u>	•			
Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O' document referring to an oral disclosure, use, exhibition or other means the priority date claimed O' document published prior to the international filing date but later than the priority date claimed O' document published prior to the international filing date but later than the priority date claimed O' document published prior to the international filing date but later than the priority date claimed O' document published prior to the international filing date but later than the priority date claimed O' document published prior to the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family Date of mailing of the international search report 07 September, 2004 (07.09.04) Authorized officer	Further doc	cuments are listed in the continuation of Box C.	See patent famil	y annex.	
to be of particular relevance (E) carlier application or patent but published on or after the international filing date (L) document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) (D) document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed (D) document published prior to the international filing date but later than the priority date claimed (E) arrived an application but cited to understand the principle or theory underlying the invention annot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family (D) Date of the actual completion of the international search 20 August, 2004 (20.08.04) (D) Date of mailing of the international search report 07 September, 2004 (07.09.04) (D) Authorized officer (A) (A) (A) (A) (D) (D) (D) (D)	Special categ	ories of cited documents:			notional Cities de la constant
filing date document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O' document referring to an oral disclosure, use, exhibition or other means the priority date claimed O' document published prior to the international filing date but later than the priority date claimed O' attemption of the international filing date but later than the priority date claimed O' attemption of the international filing date but later than the priority date claimed O' attemption or other means document referring to an oral disclosure, use, exhibition or other means the priority date claimed O' attemption of the internation or other means the priority date claimed O' attemption of the internation or after the internation or other means document or particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family O' attention of the international search and the priority date claimed O' attention of the internation of the invention cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is accombined with one or more other such documents, such combined with one or more other such documents. O' attention of the internation of the internation of the internation of the invention of		tining the general state of the art which is not considered cular relevance			
document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) O' document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed O' document published prior to the international filing date but later than the priority date claimed O' document published prior to the international filing date but later than the priority date claimed O' document member of the same patent family O' document member of the same patent family O' document published prior to the international filing date but later than the priority date claimed O' document member of the same patent family O' September, 2004 (07.09.04) Authorized officer Authorized officer	"E" earlier applica	ation or patent but published on or after the international	. ale principie of met	ory underlying the in-	vention
cited to establish the publication date of another citation or other special reason (as specified) O' document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family Date of mailing of the international search report 07 September, 2004 (07.09.04) Japanese Patent Office Authorized officer	'L" document wh	nich may throw doubts on priority oldings and it	considered novel of	u cannoi de concial	ered to involve an inventive
Or document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed Oate of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search 0.7 September, 2004 (07.09.04) Date of mailing address of the ISA/ Japanese Patent Office Authorized officer		to establish the publication date of another citating and the same as when the document is taken alone			
P." document published prior to the international filing date but later than the priority date claimed Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search 07 September, 2004 (07.09.04) Date of mailing of the international search report 07 September, 2004 (07.09.04) Authorized officer	opcomi icasoi	ent referring to an oral disclosure, use, exhibition or other means			
Date of the actual completion of the international search 20 August, 2004 (20.08.04) Date of mailing of the international search 07 September, 2004 (07.09.04) Date of mailing of the international search report 07 September, 2004 (07.09.04) Authorized officer	r. document put	rament published prior to the international filing date but later than being obvious to a person skilled in the art			
Authorized officer 20 August, 2004 (20.08.04) 07 September, 2004 (07.09.04) Authorized officer	ano priority da	no Clamped	"&" document member of	of the same patent far	mily
Authorized officer 20 August, 2004 (20.08.04) 07 September, 2004 (07.09.04) Authorized officer	Date of the actual	completion of the international search	Dota of '''		
Japanese Patent Office Authorized officer Authorized officer	20 Augu	st, 2004 (20.08.04)	O7 Septemb	international search	report
Japanese Patent Office			, coptem	, 2004 ·	(0/.09.04)
Japanese Patent Office	Name and mailing	address of the ISA/	Australia Co		
	Japanes	e Patent Office	Aumonzed officer		
acsimile No.	acsimile No.			•	
rm PCT/ISA/210 (second sheet) (January 2004)	rm PCT/ISA/210	(second sheet) (January 2004)	Telephone No.	<u>-</u>	

INTERNATIONAL SEARCH REPORT

International application No.

Category* Citation of document, with indication, where appropriate, of the relevance of th		Relevant to claim I
Valorisation de la Recherche), 26 April, 1986 (26.04.86),		
Full text; all drawings & EP 165119 A1 & US 4914351 A		1
A JP 52-129369 A (S.R.C. Laboratories, Inc 29 October, 1977 (29.10.77), Full text; all drawings & US 4143291 A & FR 2349211 A & GB 1556516 A	c.),	1
		·

		—————————————————————————————————————	004/008442
A. 発明の	属する分野の分類(国際特許分類(I P C))) .	
Int.	. Cl' H01J43/22	·. ·	
		•	
B. 調査を			· · · · · · · · · · · · · · · · · · ·
調査を行った	最小限资料(国際特許分類(IPC))		
Int.	C1' H01J43/00-43/30		
最小限資料以外	外の資料で調査を行った分野に含まれるもの		
一 日本国	実用新案公報	年	
日本国	公開実用新案公報 1971-2004	在	
日本国	登録実用新案公報	年 年 · · · · · · · · · · · · · · · · · · ·	•
			
	用した電子データベース (データベースの名を	你、調査に使用した用語)	
	:		•
·C. 関連する 引用文献の	ると認められる文献		
カテゴリー*	引用文献名 及び一部の箇所が関連する	ひときけ その関連ナス体配のまっ	関連する
A	JP 9-45275 A (浜松ホ	(トニクス件学会社)	請求の範囲の番号
	1997.02.14,全文,全	・ アンスが大会社)	1 .
231	& EP 743672 A2.		
<i>i</i> 3	& US 5841231 A		
Α	IP 5-995970 A (With		
	JP 5-325878 A (浜松 1993. 12. 10, 段落【0	マークス株式会社)	1
]	& EP 571185 A1	0067,图7,8	
	& US 5578891 A		
·		·:	
- ; 	Ir d detharman to		
	にも文献が列挙されている。	□ パテントファミリーに関する別	紙を参照。
* 引用文献の	カテゴリー・	の日の後に公表された文献	· · · · ·
もの	のある文献ではなく、一般的技術水準を示す	「T」国際出願日又は優先日後に公表さ	れた文献であって
「E」国際出願	日前の出願または特許であるが、国際出願日	出願と矛盾するものではなく、発 の理解のために引用するもの	閉の原理又は理論
・以後に公	表されたもの 張に疑義を提起する文献又は他の文献の発行	「X」特に関連のある文献であって、当	i該文献のみで発明
日若しく	は他の特別な理由を確立するために引用する	の新規性又は進歩性がないと考え	られるもの
文献 (理	由を付す)	「Y」特に関連のある文献であって、当 上の文献との、当業者にとって自	
「P」国際出願	る開示、使用、展示等に 首及する文献 日前で、かつ優先権の主張の基礎となる出願	よって進歩性がないと考えられる	もの
			204
国際調査を完了	20.08.2004	国際調査報告の発送日 07.9.20	704
国際調査機関の: 日本国4	名称及びあて先 特許庁(ISA/JP)	特許庁審査官 (権限のある職員)	2G 9215
郵任	更番号100-8915	· 堀部 修平	
東京都	千代田区酸が関三丁目4番3号	電話番号 03-3581-1101	内線 3225
			

C (続き).	関連すると認められる文献	
引用文献の カテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する
A (ii)	JP 62-287560 A (エヌ・ベー・フイリツプス・フルーイランペンフアブリケン) 1987. 12. 14, 全文, 全図 & US 4871943 A & GB 2192485 A & FR 2599556 A	1
A	JP 61-82646 A (アジヤンス ナショナル ドウ ヴェロリザシオン ドウ ラ ル シエルシエ) 1986.04.26,全文,全図 & EP 165119 A1 & US 4914351 A	1
A A	JP 52-129369 A (エス・アール・シー・ラボラトリーズ・インコーポレーテツド) 1977.10.29,全文,全図 & US 4143291 A & FR 2349211 A & GB 1556516 A	1 ,
-		
. 1. # :		